Office of the Chief Information Officer
Network Engineering Division

Telecommunications Enterprise Network Configuration Management

Enterprise Network Operations Center

Concept of Operations

December 17, 1997

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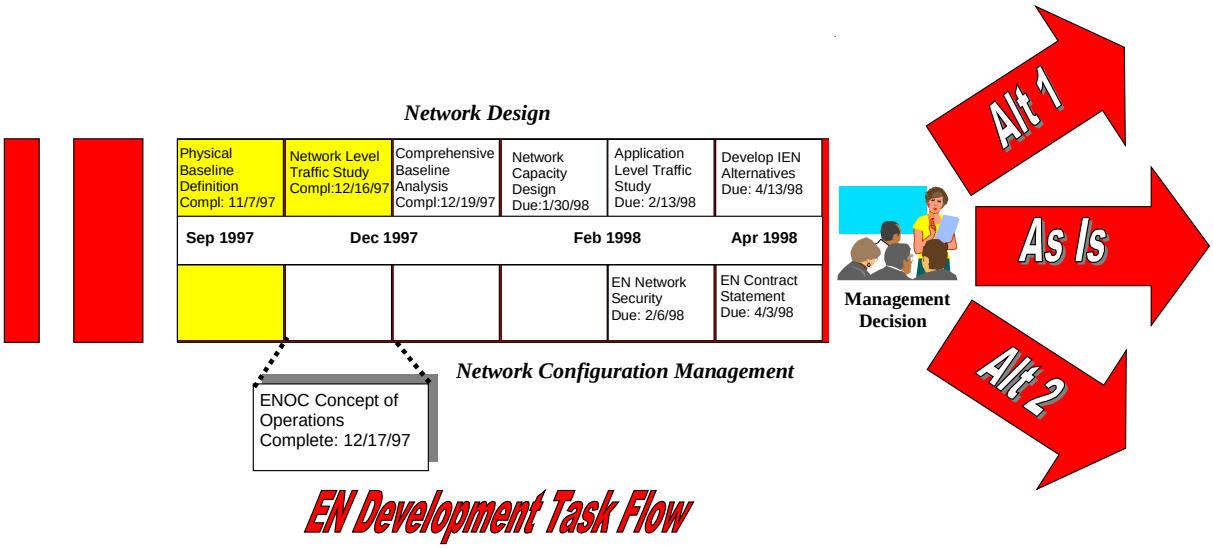
Procurement Sensitive

Executive Summary

The Telecommunications Stabilization and Migration Program proposes the creation of a Telecommunications Enterprise Network to conduct the USDA mission programs into the future. The method of operation of the Telecommunications Enterprise Network is critical to the value and success of the telecommunications program.

Telecommunications Enterprise Network operation is the responsibility of an Enterprise Network Operations Center. The Enterprise Network Operations Center is managed by USDA approved contractors with oversight provided by two teams: the Architecture and Design Team and the Configuration Management Team.

Enterprise Network Operations Center management responsibilities include Fault Management, Configuration Management, Performance Management, Accounting Management, and Security Management. This report defines the various responsibilities and describes the functional relationships between the Enterprise Network Operations Center and the other pertinent organizations. It depicts the Enterprise Network Operations Center operation with the Architecture and Design Team, the Business Services and the Telecommunications Ordering, Billing, and Inventory process, and the Network Services offerings. The reader should understand the *USDA Information Systems Technology Architecture: Part II, Technical Standards and Part III, Telecommunications.*



1.0 Introduction

The USDA, in support of the President's National Performance Review (NPR) objectives, created the Telecommunications Stabilization and Migration Program (TNSMP). The TNSMP identifies criteria for optimizing USDA Telecommunications – where optimization is defined as improved performance at reduced or same cost or reduced costs for the same performance and service. The central concept of optimization is telecommunications consolidation to form an enterprise network that promotes sharing of telecommunications assets and services.

The USDA Telecommunications Enterprise Network (TEN) provides telecommunications services to the Agencies and Organizations of the Department. The type and scope of services, demarcation points, and central responsibilities are described in *USDA* Information *Systems Technology Architecture Part III: Telecommunications Architecture, Revision 2.0 August 14, 1997* (referred to as the Telecommunications Architecture in the remainder of this document). Understanding that document is essential to understanding this concept of operations.

The requirements for telecommunications services come from the USDA agencies and are defined by the business needs of those Agencies. The capital planning process established in USDA provides for management business decisions to guide information technology investments. The relationship is conceptually depicted in Figure 1.

In its initial form, the USDA TEN is a data network which includes transport services for Local Area Networks (LANs), remote access service, gateway service, access to central information services, and network management services. Future enhancements include video and voice technology and additional services.

Realization of the USDA TNSMP is the responsibility of the Office of the Chief Information Officer (OCIO) operating through Business Services, Network Services, and Network Engineering teams. The OCIO plan to implement the TNSMP proposes six initiatives:

- Business Requirements and Services Integration
- Acquisition and Inventory Administration [Telecom Ordering, Billing, and Inventory System (TOBI)]
- Program Compliance and Security
- Network Architecture and Design
- Network Implementation
- Configuration Management

Network Engineering responsibility includes the last three initiatives. In order to meet the TNSMP responsibilities, the OCIO is tasked with creation of an

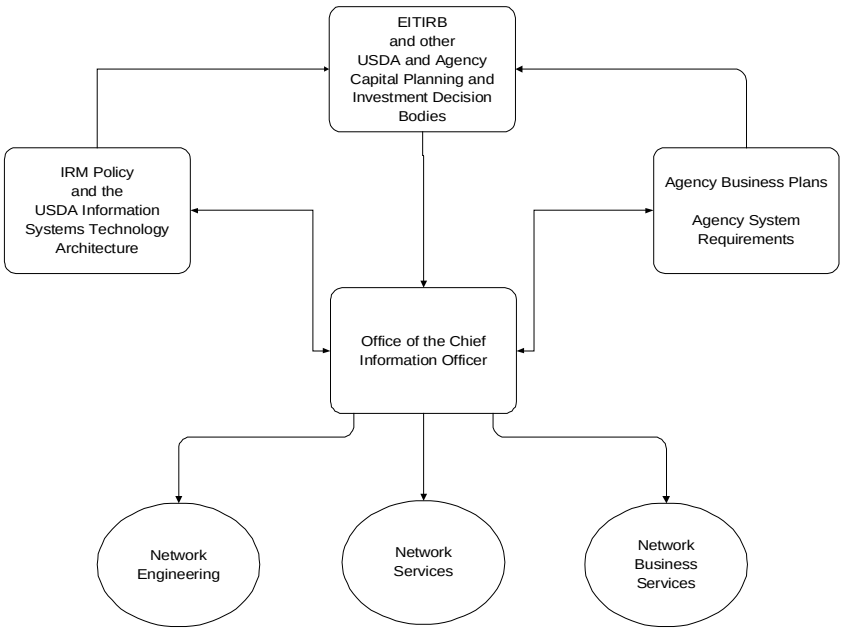


Figure 1 External Business Interfaces

Enterprise Network Operations Center (ENOC), the operational entity of the USDA TEN. Contractors manage the center with direction from two operationally interrelated teams. Although the teams have individual network operating tasks, it is the interrelationship of the teams with the ENOC that results in fully functioning USDA Telecommunications Enterprise Network management. The functionally interrelated teams are:

- Network Architecture and Design
- Network Configuration Management

The focus of this report is operational management of the ENOC. The document defines roles and responsibilities of TEN configuration management with particular emphasis on the interrelationships between the ENOC and the operating teams. The report organization defines roles and responsibilities assuming that contractors operate the ENOC and configuration management extends to the demarcation point of the TEN.

The Telecommunications Architecture defines the demarcation point of the TEN as the USDA occupied building or campus location. The TEN responsibility extends to and includes the interface device (e.g. the ethernet port on the router that connects the agency LAN to the Enterprise Network.) The implementation will be phased. Each phase will

define a demarcation point for agency connectivity. Agencies are responsible for configuration and security management past the TEN demarcation point.

Although many configuration management roles and responsibilities are described by this report, there are notable exceptions. Specifically, the report does not address several issues that require management decision. These issues include:

- funding and chargeback strategies for the TEN
- procedures for incorporating existing USDA network resources into the TEN
- the acquisition and ownership of new telecommunications network resources
- implementation resources and roles (Engineering and Implementation).
- organizational and fiscal structure for possible configuration management service past the demarcation point (optional management of agency resources)

The network services (E-mail, Internet access, remote access, etc.) could be managed by the ENOC or may have individual staffs. Some management details of the individual services may need explicit specifications in a statement of work; however, the functions are the same. If the ENOC manages these services, the relationships of the ENOC with other OCIO staff responsible for such services must be similarly defined. Each team must further define the operational processes for the responsibilities described.

The Network Engineering teams will both supply data to and use data from the TOBI system. Network Business Services is currently developing and deploying TOBI. TOBI has been designed to be the central telecommunications asset management system for USDA. It provides and manages information at the organizational level while the ENOC management is at the operational level.

2.0 Network Management Functions and the ENOC

The fundamental network management functions are:

- Fault Management
- Configuration Management
- Performance Management
- Accounting Management
- Security Management

The ENOC has the operational role in each for these functions. However, they are not accomplished independently by the ENOC. Successful accomplishment of network management functions requires sharing, both giving and receiving, information with the various Network Engineering teams as well as service providers and designated network personnel of USDA Agencies (Fig. 2). The descriptions of configuration management functions that follow are organized by defining the function, describing the teams involved

and their interrelationships, and, as much as possible, the information that is exchanged between ENOC participants. In the final analysis, a Network Management System (NMS) must be adopted that meets all of the requirements for an enterprise network.

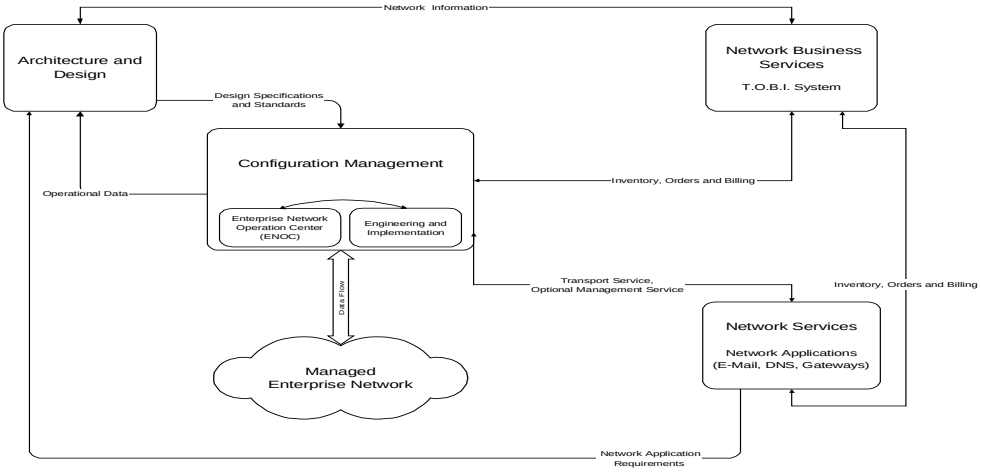


Figure 2 Network Engineering Division Relationships

2.1 Fault Management

Fault management is the process of detecting, identifying, locating, logging, and correcting network problems. The ENOC monitors the network to identify and correct errors, outages, or other events that could cause transport service to be interrupted or lost. (Fig. 3)

The ENOC identifies a problem, describes the symptom(s), and determines, if possible, the root cause of the fault. The ENOC response is a twofold process. An immediate, temporary solution to a problem is implemented that provides immediate resumption of service to the customer. The ENOC notifies the **Architecture and Design Team** of the problem and assists in the analysis and determination of root cause. Upon determination of long-term corrective action, the ENOC implements appropriate actions, for example, notifying service providers to initiate specific corrective actions, shipping replacement equipment, etc.

The ENOC monitors network quality, grade of service, and attempts to identify conditions that are potential problems before they degrade network performance. The ENOC takes action to prevent marginal components from affecting the network whenever possible. The ENOC logs, tracks, and reports quality of service problems to the service providers and the **Architecture and Design Team**.

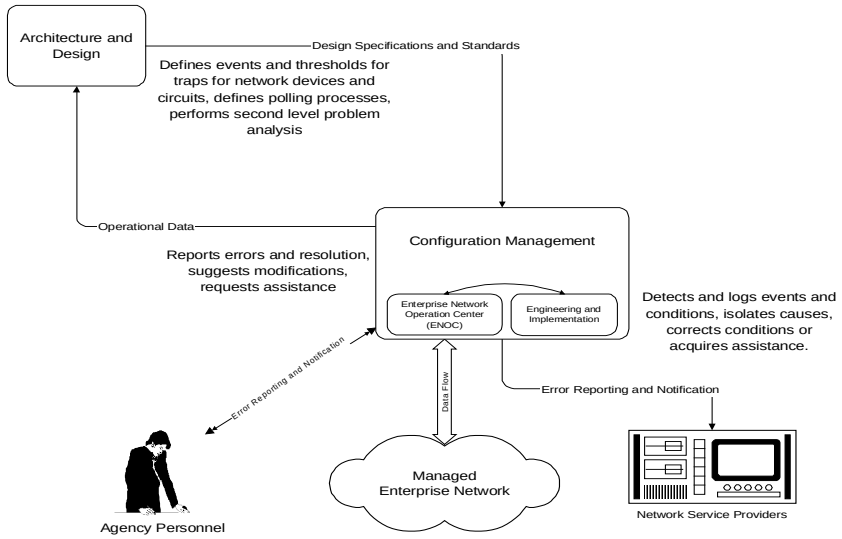


Figure 3 Fault Management Functions

ENOC fault management responsibilities include the creation and operation of a help desk function where Agency personnel can report network problems and receive network assistance. The help desk accepts calls from any USDA employee with any problem. The help desk staff attempts to define the problem. Non-network problems are referred to the proper agency support personnel. Agencies' help desks should refer any suspected network problem to the ENOC.

In order to capture all communication from customers and maintain corrective action process integrity, the ENOC help desk is the sole contact point for reporting, tracking, and resolving network problems. The **Network Architecture and Design** and **Configuration Management Teams** will insure that the help desk processes any customer problem contacts. The ENOC help desk receives customer problem reports and advises agency representatives of problem resolution. The help desk takes pre-emptive action by notifying agency representatives of problems that could affect Agency mission performance. An ancillary function of the help desk is to maintain a record of problems, initial corrective actions and final resolutions.

The ENOC and Network Engineering teams have a specific operational relationship that is described in terms of problem resolution. After the ENOC provides immediate corrective action for customer problems, the ENOC formally notifies the **Network Architecture and Design**, and the **Network Configuration Management Teams** of the problem. The two teams are responsible for providing secondary level problem support. This support includes in-depth technical problem analysis, determination of root cause, and development of appropriate problem solution(s). The third level of problem resolution is that provided by the vendor. To maintain corrective action

process integrity, vendor problem resolution must be requested by the Network Engineering teams and implemented only through normal ENOC channels.

All devices comprising the enterprise network are configured to report events through Simple Network Management Protocol (SNMP). The **Architecture and Design Team** is responsible for defining the SNMP events and traps to be reported as well as suggested responses to each. The **Architecture and Design Team** defines the quality of service indicators and thresholds to be monitored. The ENOC advises the **Architecture and Design Team** of the need for modifications of the monitored events, thresholds, and traps.

2.2 Configuration Management

System configuration is a description of a system in terms of the arrangement of its elements. Telecommunications network configuration specifically refers to the description of the network in terms of its hardware, software, performance, and connectivity. Hardware and software description requires detailed knowledge of type, model, version, release/manufacture date, and quantity. Connectivity description means detailed knowledge of the type, location, and capacity of connections. Performance configuration means the recording of usage and problems and errors associated with network elements. Configuration management is the process of documenting and controlling configuration information about the network and network resources. The control aspect of configuration management includes the establishment and modification of all network elements.

Configuration management of the USDA TEN is a responsibility shared by the ENOC and the Network Engineering teams. The ENOC is responsible for maintaining inventory records of each device, its pertinent configuration data, history, connectivity and performance information. The **Architecture and Design Team** establishes standards for configuration variables of the network elements. In addition, **the Architecture and Design Team** directs configuration changes by the ENOC, and establishes network standards including Internet Protocol (IP) addressing structure, naming standards, SNMP variables and event thresholds. (Fig. 4)

The **Configuration Management Team** is responsible for initial network configuration by performing deployment and connection of resources. Additional responsibilities include planning and scheduling network changes – additions, deletions, and modifications – such as changing software, dropping and adding circuits, changing network variables etc.

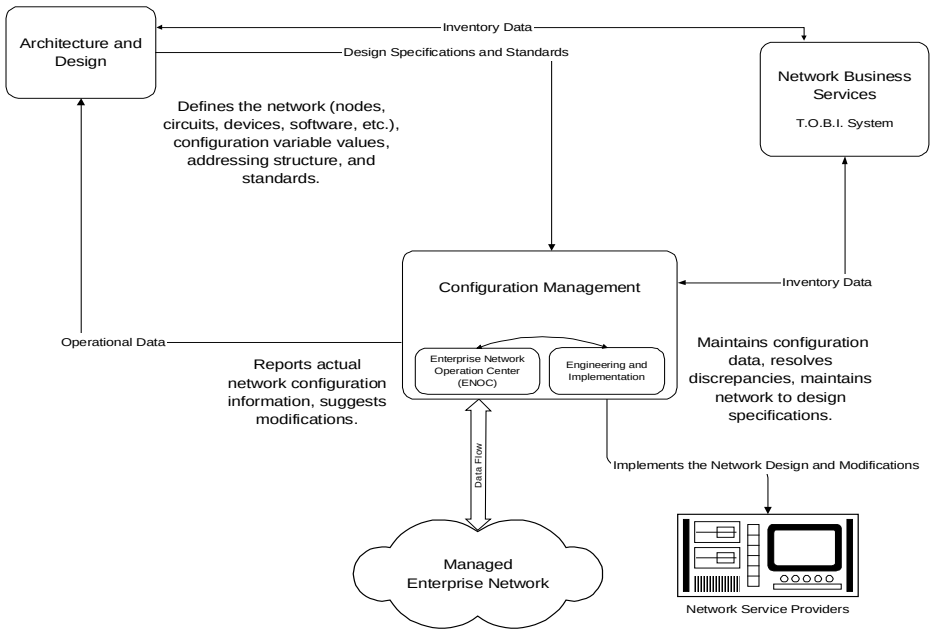


Figure 4 Configuration Management Functions

The configuration inventory data is coordinated and shared with the TOBI system. Configuration management requires more detailed data about the resources than TOBI. The detailed configuration inventory provides data about the Enterprise Network (EN) only. Reconciliation of records and record interchange enables inventory and billing information consistent with the physical reality of the EN. Information from the TOBI system provides added data to the network design and engineering efforts.

2.3 Performance management

Performance management is the process of collecting data on the utilization of devices and circuits, analyzing the data, and determining thresholds and capacities needed to meet pre-defined performance standards. Performance management functions performed by the ENOC include performance data collection and performance problem resolution. (Fig. 5)

The ENOC collects, maintains, and reports information on the EN performance. Basic performance functions include analysis of error conditions and rates, utilization analysis, trend analysis, and performance forecasting. Utilization information on the EN components are collected, maintained, and reported to the **Architecture and Design Team.**

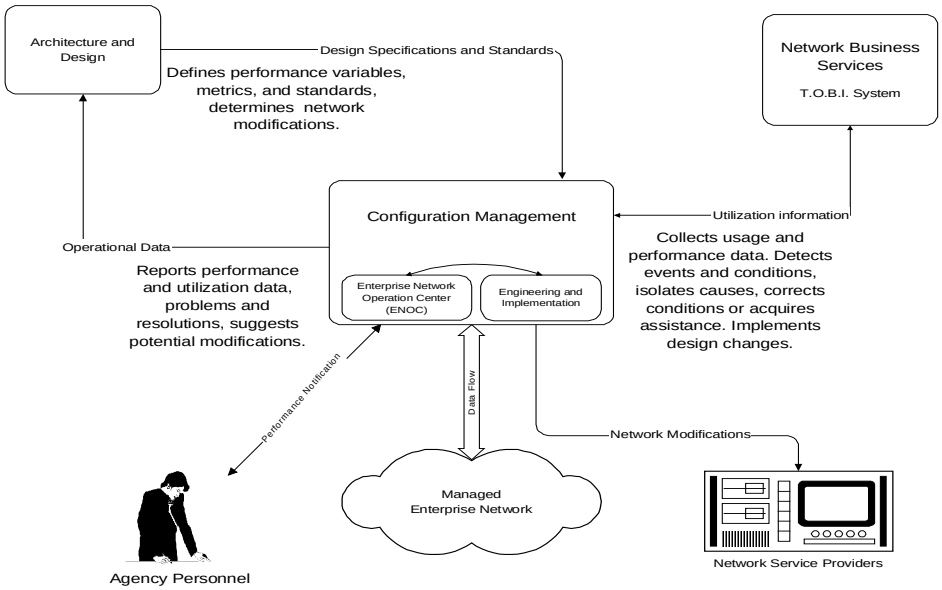


Figure 5 Performance Management Functions

Performance problem resolution is the other key function of the ENOC. In response to EN performance problems such as unexpected usage peaks and bottlenecks, the ENOC takes immediate action to resolve the conditions. It is also the responsibility of the ENOC to implement network performance optimization tasks created by the **Architecture and Design Team.**

Network Engineering teams direct performance management implemented by the ENOC. The **Architecture and Design Team** defines resources, specific variables, units of measure, sources of data to be monitored, and network performance standards. The **Configuration Management Team** plans and coordinates the execution of changes defined by the **Architecture and Design Team.**

2.4 Accounting Management

Accounting management is the process of gathering network resource utilization data in order to make decisions regarding the use of network resources. Network utilization information enables management to set policies, determine cost areas, and bill users with the single goal of recovering network operating costs. Cost for usage – chargeback – is central to the role of network accounting management. If chargeback is not the cost recovery mechanism, the scope of accounting management is significantly reduced. (Fig. 6)

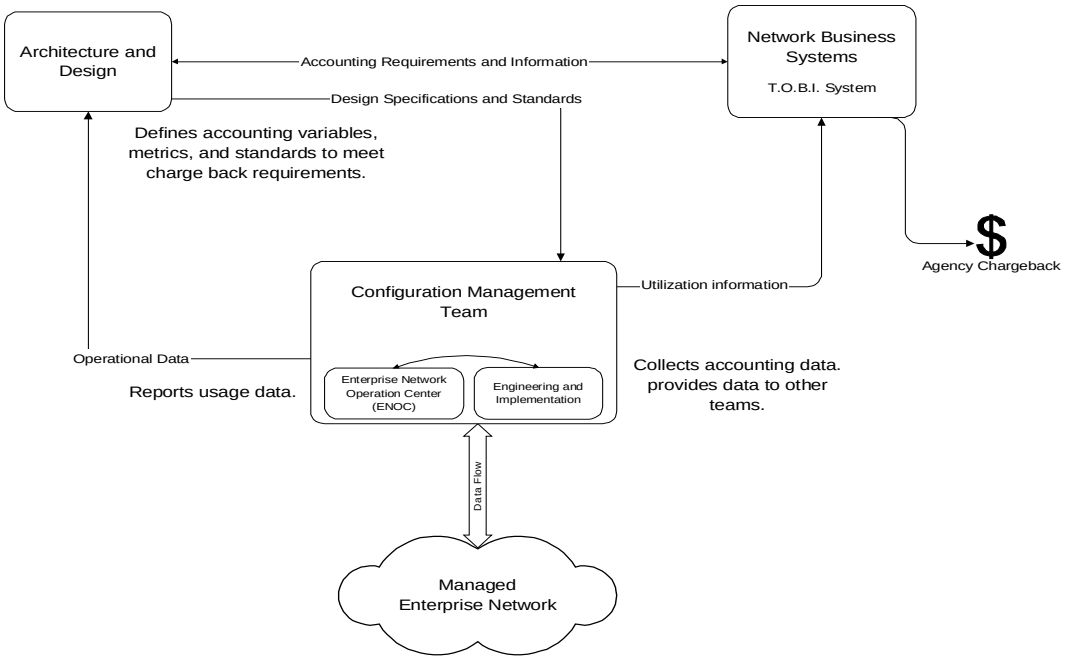


Figure 6 Accounting Management Functions

Responsibility for network account management is shared between the Network Business Services and the Network Engineering Teams. The Architecture and Design Team identifies tools, capture points, and, if possible, appropriate metrics that meet management accounting needs. The ENOC provides the specified usage data to TOBI.

Accounting functions fall to Network Business Services and the TOBI system for chargeback and reconciliation.

2.5 Security management

Network security management is the process established to control USDA network and USDA product sensitive information. Responsibility for network security is ultimately Department-wide but the ENOC and Network Engineering Teams share the functional operations responsibility. (Fig. 7)

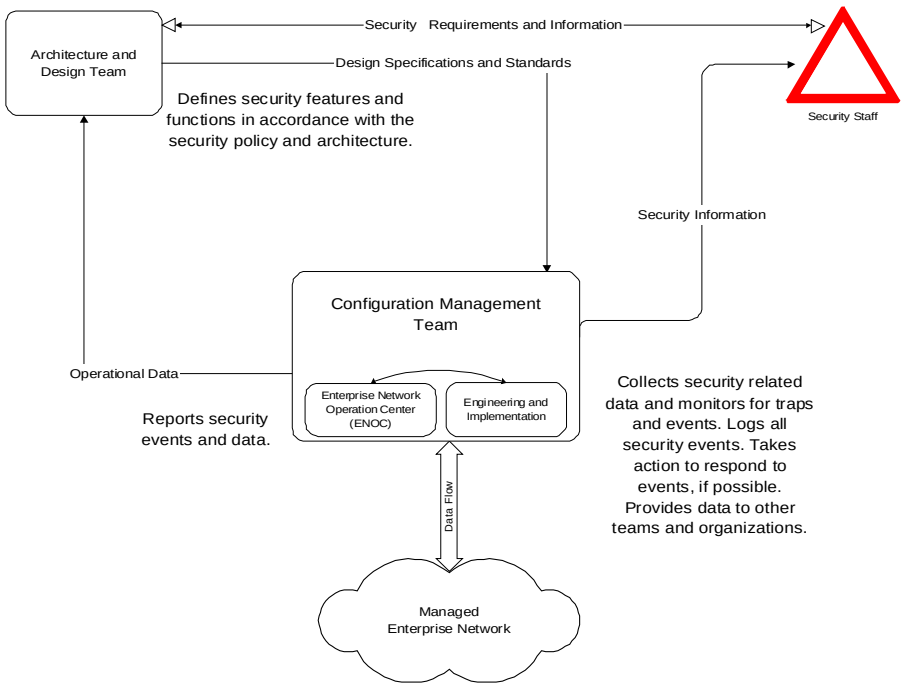


Figure 7 Security Management Functions

The **Architecture and Design and the Configuration Management Teams** define appropriate network security processes and requirements in compliance with the Information Systems Technology Architecture and USDA policy. The ENOC is responsible for monitoring and maintaining network security records – Network Security Alerts (NSA). The ENOC logs, analyzes, and, if possible, resolves NSAs in a timely manner. NSAs are reported to the **Architecture and Design Team** for verification of ENOC response and possible process modification. Further reporting of events, responses, and resolutions occur in conformance with USDA security policy.

3.0 ENOC Function Support Tasks

The ENOC Concept of Operations presented in this report defines the necessary and sufficient functions required for TEN operation. However, establishing the operating functions is only the beginning. To successfully perform the operating functions, a complete array of support processes needs to be developed, approved, and implemented.

TEN operating processes define the procedural details for the operating relationships between management, operations, and users. Some of the necessary processes include:

- Network Design/Change Implementation Process – How new designs and changes are determined, documented, implemented and tracked.
- Complaint /Problem Handling Process – How complaint/problem reports are tracked, reporting format, resolving issues, documenting and implementing resolution
- Network Security Alert Process – Define process including levels of criticality, staff requirements, and compliance with USDA policy.
- ENOC Performance Monitoring Process - What performance characteristics to monitor, monitoring procedure, performance tracking, sampling plan, control charts (attribute and variable).
- ENOC Quality Audit Process – Periodic assessment of ENOC operation to check adherence to procedures, personnel training, record maintenance, service performance, inventory management, financial accounting, corrective action, etc.
- Enterprise Network Standards and Procedures – mandatory use programs, TCP/IP, circuit and equipment standards, naming standards, addressing standards, LAN standards.
- Information interchange with the TOBI system.

These items will be addressed in the design and implementation procedures.